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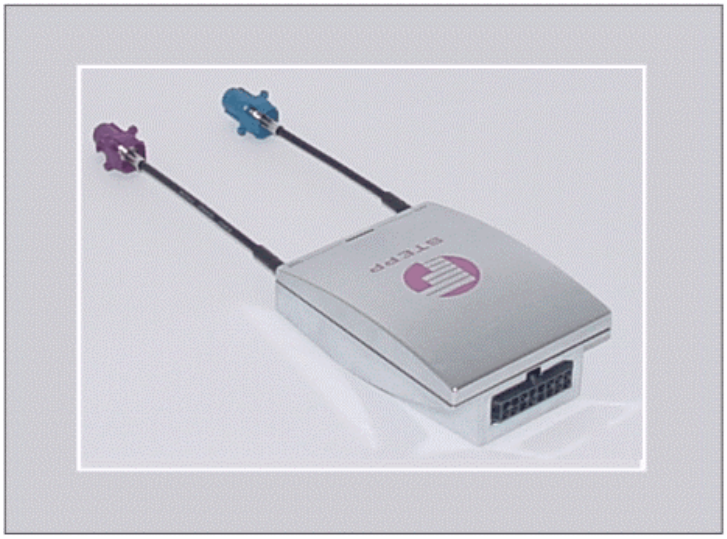
STEPP

Hardware description



Version 1.10

Index of contents

0 INTRODUCTION 5

0.1 GENERAL 5
0.2 USED ABBREVIATIONS 6
0.3 RELATED DOCUMENTS 7

1 SECURITY 8

1.1 GENERAL INFORMATION 8
1.2 EXPOSURE TO RF ENERGY 8
1.3 EFFICIENT MODEM OPERATION 8
1.4 ANTENNA CARE AND REPLACEMENT 9
1.5 DRIVING 9
1.6 ELECTRONIC DEVICES 9
1.7 VEHICLE ELECTRONIC EQUIPMENT 9
1.8 MEDICAL ELECTRONIC EQUIPMENT 9
1.9 AIRCRAFT 9
1.10 CHILDREN 10
1.11 BLASTING AREAS 10
1.12 POTENTIALLY EXPLOSIVE ATMOSPHERES 10
1.13 NON-IONISING RADIATION 10

2 SAFETY STANDARDS 11

3 TECHNICAL DATA 12

4 FUNCTIONAL DESCRIPTION 13

4.1.1.1 Determining the External Equipment Type 14

5 GSM CORE 16

5.1 GENERAL 16
5.2 GSM DATA SERVICES 16
5.2.1 RF characteristics 16

6 GPS CORE 18

6.1 GENERAL 18
6.2 TECHNICAL DATA 18
6.2.1 NMEA data message 18

7 HARDWARE INTERFACES 19

7.1 INTERFACE A (16PIN MOLEX 43045-1609) 20
7.1.1 Description of the 16- pin connector 20
7.1.2 Special pin description 21
7.1.2.1 Analog inputs (pin 2, 4) 21
7.1.2.2 Inputs (pin 6, 8, 10, 12) 22
7.1.2.3 Outputs (pin 5, 7, 9, 11) 23
7.1.2.4 BATT On/Off (pin 14) 23
7.1.2.5 Ignition (pin 13) 24
7.2 INTERFACE B (SIM-CARD INTERFACE MOLEX-91228-0002) 25
7.3 INTERFACES C AND D 26
7.4 INTERFACE E (AMP 5-558556-1 CONNECTOR) 26
7.4.1 The 15- pin connector description 27
7.4.2 Special pin description 27
7.4.2.1 VC 5 27
7.4.2.2 Boot select 28
7.4.2.3 RxA, TxA 28
7.4.2.4 Speaker outputs characteristics 28

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7.5 INTERFACE F (LED'S DESCRIPTION) 28

8 HOUSING 29

9 STEPP-MOUNTING BRACKET 30

10 APPENDIX 31

10.1 SCHEMATICS 31
10.1.1 Installation guidance for 16pin Molex connector 31
10.1.2 Installation guidance for 15-pin AMP connector 32

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Version history:

Version number	Author	Changes
1.00	Fadil Beqiri	Initial version
1.01	Fadil Beqiri	Schematic example (figure 18) optimize
1.02	J.Skeide	Pin 14(Molex 16 pin) described Table 9: output description modified
1.03	Fadil Beqiri	Table 9: output description modified
1.04	Fadil Beqiri	Schematics example (figure 8, 9) optimize
1.05	Fadil Beqiri	Pin 14 in schematic example (figure 18) added The names of Pin (5 and 7) on the Table 9 are changed.
1.06	Fadil Beqiri	Update of Pin 14 (BATT ON/OFF) Current consumption in Standby updated. The names of Pin (5 and 7) in the Table 9 are changed. New feature of the GPS LED (yellow one) on the chapter 4 Functional description added.
1.07	Fadil Beqiri	Current consumption in Standby mode removed.
1.08	Fadil Beqiri	Output 1 and 2 on the 16-pin Molex connector exchanged to pin 7 and 5 respectively (table 9 updated). Figure 18 updated, too.
1.09	Fadil Beqiri	The BATT On/Off pin on the 16-pin connector updated.
1.10	Fadil Beqiri	The schematic example (figure 18) improved (a 2A-Fuse added).

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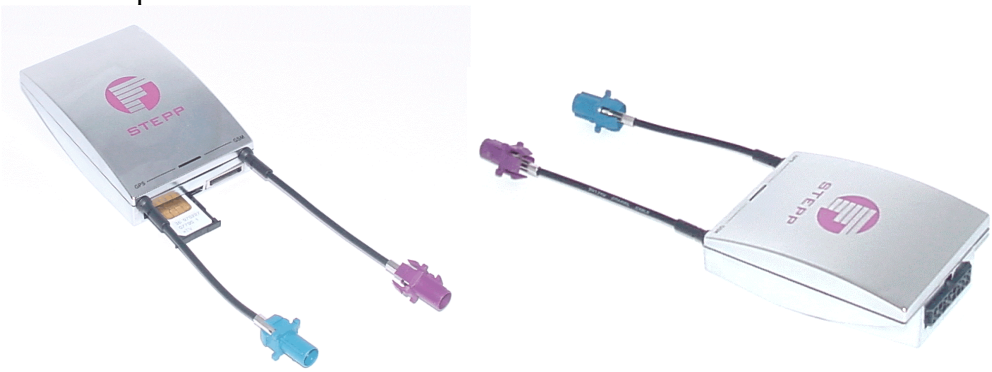
0 Introduction

0.1 General

This description is focused on the GSM/GPS terminal STEPP from Falcom GmbH. It contains short information about purpose and use of the STEPP concept. The STEPP is a combined GSM/GPS device.
Figure 1 shows the front and back side of the STEPP.
Please read this User Manual very carefully to avoid mistakes and to make sure an optimal use of the device.



a) back side **b) front side**

figure 1: front and back side of STEPP

The STEPP architecture integrates (**see figure 2**):

- ✓ high-performance Dual-Band GSM core
- ✓ 12 parallel channel low-power GPS core
- ✓ ARM7TDMI Processor that controls all functions of the system
- ✓ Power Control circuitry with 1100 mAh Li-Ion, backup battery
- ✓ Audio amplifier
- ✓ Interface circuitry

The STEPP has the following external interfaces:

- ✓ 16 pin Molex connector (Type: Molex 43045-1609) for power supply and I/O's
- ✓ 15pin AMP connector (Type: AMP5-558556-1) for audio interfaces and software update
- ✓ SIM Card reader (Type: Molex-91228-0002 small SIM Card)
- ✓ GSM antenna interfaces (Type: Connector 50 Ω Fakra/Radial SMB-male)
- ✓ GSM antenna interfaces (Type : Connector 50 Ω Fakra/Radial SMB-male)

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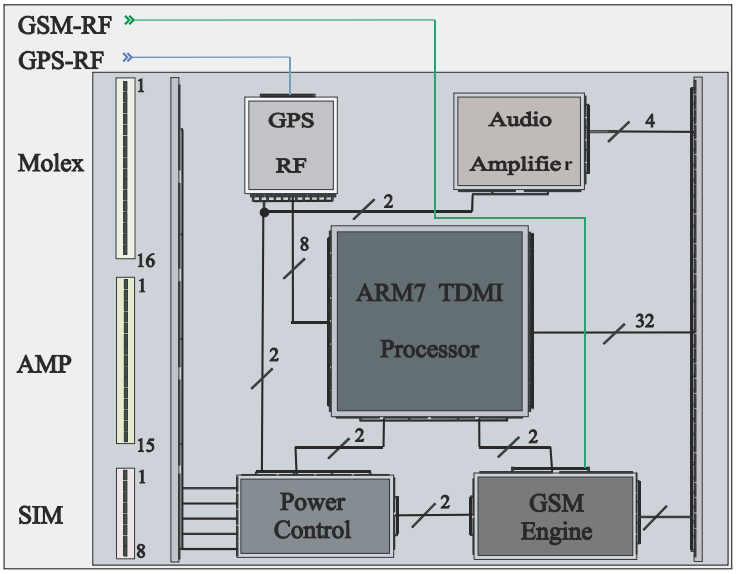

figure 2: Architecture of the STEPP

0.2 Used abbreviations

Abbreviation	Description
DOP	Dilution of Precision
GPS	Global Positioning System
GSM	Global Standard for Mobile Communications
GGA	GPS Fixed Data
HDOP	Horizontal DOP
HW	Hardware
IMEI	International Mobile Equipment Identity
I/O	Input/Output
NMEA	National Marine Electronics Association
PRN	Pseudorandom Noise Number – The Identity of GPS satellites
RF	Radio Frequency
RTC	Real Time Clock
RXQUAL	Received Signal Quality
SIM	Subscriber Identification Module
SMS	Short Message Service

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Abbreviation	Description
SRAM	Static Random Access Memory
TA	Terminal Adapter
TE	Terminal Equipment
TP	Transmit Protocol
TTFF	Time to First Fix
SA	Selective Availability
WAAS	Wide Area Augmentation System
MSK	Minimum Shift Keying

table 1: Used abbreviations

0.3 Related documents

1. ETSI GSM 07.05:"Use of Data Terminal Equipment–Data Circuit terminating Equipment interface for Short Message Service and Cell Broadcast Service"
2. ETSI GSM 07.07"AT command set for GSM Mobile Equipment"
3. ITU-T V.25ter"Serial asynchronous automatic dialling and control"
4. SiRF binary and NMEA protocol specification; www.falcom.de/Service/Manuals/SiRF

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1 Security

IMPORTANT FOR THE EFFICIENT AND SAFE OPERATION OF YOUR GSM-MODEM, READ THIS INFORMATION BEFORE USE!

Your cellular engine STEPP is one of the most exciting and innovative electronic products ever developed. With it you can stay in contact with your office, your home, emergency services and others, wherever service is provided.
This chapter contains important information for the safe and reliable use of the STEPP. Please read this chapter carefully before starting to use the cellular engine STEPP.

1.1 General information

Your STEPP device utilises the GSM/GPS standard for cellular technology. GSM is a newer radio frequency („RF“) technology than the current FM technology that has been used for radio communications for decades. The GSM standard has been established for use in the European community and elsewhere. Your modem is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use Your modem, the cellular system handling your calls controls both the radio frequency and the power level of Your cellular modem.

1.2 Exposure to RF energy

There has been some public concern about possible health effects of using GSM modem. Although research on health effects from RF energy has focused for many years on the current RF technology, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product is fit for use.
If you are concerned about exposure to RF energy there are things you can do to minimize exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating Your cellular modem efficiently by following the guidelines below.

1.3 Efficient modem operation

In order to operate Your modem at the lowest power level, consistent with satisfactory call quality please take note of the following hints.

- If Your modem has an extendible antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However Your modem operates more efficiently with the antenna fully extended.
- Do not hold the antenna when the modem is „IN USE“. Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

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1.4 Antenna care and replacement

Do not use the modem with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.
Use only the supplied or approved antenna. Unauthorized antennas, modifications or attachments could damage the modem and may contravene local RF emission regulations or invalidate type approval.

1.5 Driving

Check the laws and regulations on the use of cellular devices in the area where you drive. Always obey them. Also, when using Your modem while driving, please pay full attention to driving, pull off the road and park before making or answering a call if driving conditions so require. When applications are prepared for mobile use they should fulfil road-safety instructions of the current law!

1.6 Electronic devices

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However RF energy may affect some malfunctioning or improperly shielded electronic equipment.

1.7 Vehicle electronic equipment

Check Your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from RF energy.

1.8 Medical electronic equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy.
Turn Your STEPP device OFF in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

1.9 Aircraft

Turn Your STEPP OFF before boarding any aircraft.
Use it on the ground only with crew permission.
Do not use it in the air.
To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use Your modem while the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using Your modem whilst airborne.

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1.10 Children

Do not allow children to play with Your STEPP device. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem or make calls that increase Your modem bills.

1.11 Blasting areas

To avoid interfering with blasting operations, turn Your unit OFF when in a "blasting area" or in areas posted: „turn off two-way radio". Construction crew often use remote control RF devices to set off explosives.

1.12 Potentially explosive atmospheres

Turn Your STEPP device **OFF** when in any area with a potentially explosive atmosphere. It is rare, but Your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.
Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations; below decks on boats; fuel or chemical transfer or storage facilities; and areas where the air contains chemicals or particles, such as grain, dust or metal powders.
Do not transport or store flammable gas, liquid or explosives, in the compartment of Your vehicle which contains Your modem or accessories.
Before using Your modem in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

1.13 Non-ionising radiation

As with other mobile radio transmitting equipment users are advised that for satisfactory operation and for the safety of personnel, it is recommended that no part of the human body be allowed to come too close to the antenna during operation of the equipment.
The radio equipment shall be connected to the antenna via a non-radiating 50 Ohm coaxial cable.
The antenna shall be mounted in such a position that no part of the human body will normally rest close to any part of the antenna. It is also recommended to use the equipment not close to medical devices as for example hearing aids and pacemakers.

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2 Safety standards

This GSM/GPS modem complies with all applicable RF safety standards.
The embedded GMS/GPS modem meets the safety standards for RF receivers and the standards and recommendations for the protection of public exposure to RF electromagnetic energy established by government bodies and professional organizations, such as directives of the European Community, Directorate General V in matters of radio frequency electromagnetic energy.

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3 Technical Data

General specification	
Dimensions	55 mm x 80 mm x 22 mm (B x W x H)
Weight	approx. 120 g

table 2: General specification dimensions

NOTE: The given current consumption in the table below is for a full charged internal battery. In case of discharged battery the current consumption rise up to 800 mA.

Power supply			
V+ = 10.8 .. 32 V DC			
GPS on (Continuous Mode) /GSM	Average current (in mA at 12 V nominal):		
	900	1800	GSM band
	70	70	in idle mode (base station sends at -85 dBm)
	200	140	in transmit mode at maximum power level

table 3: Power supply and current consumption.

Temperature limits		
Operation/Full GSM specification compliant	Without ACCU	With ACCU
	-20°C to +55°C	0°C to +55°C
Transportation	-20°C to +70°C	
Storage	-30°C to +85°C	

table 4: Temperature range

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4 Functional description

The STEPP is a plug-and-play device that can be used as mobile Client in a variety of:

- AVL
- fleet management and monitoring
- car security and safety

system solutions.

Depending on the configuration, the device exchanges data with a server application (e.g. Mapping-Software, etc.). The STEPP can be configured by the user via local RS232-interface or via the GSM (air link).
For evaluation purposes FALCOM provides a demo software that enables basic handling and visualisation of the received data.

The demo software can be used also for configuration of the device. Using the "Configuration manager" the following settings can be done:

- History function (*combinations between time, distance and velocity, about 100.000 records possible*)
- Setting alarm inputs (*for each input individually configurable telephone number, alarm text as SMS, last position*)
- Automatic tracking (*history or current position report by timer or other event*)
- Geo-fencing (*send report when approaching pre-defined zone coordinates*)

For more information about the functions refer to the software description at the Falcom's home page: http://www.falcom.de/service/manuals/stepp.

The STEPP concept provides 6 inputs, 4 outputs and 2 analog inputs. Of the 6 inputs 4 are available to the user and 2 are defined at the factory.

Two of the inputs are pre-assigned at the factory:

- Power Supply - connect to vehicle battery (clamp 30).
- Ignition - connect to starter lock (clamp 15).

The internal backup Battery (LiIon- 1100 mAh) is available in case of external Power failure.

An audio interface allows the direct connection of a headset.

An example of a possible installation is shown in the Appendix of this manual.

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The actual status of the STEPP is displayed by two LED's on the top of modem.

- **Green ON:** Power ON, not registered in the network.
- **Green flashes (2 sec. interval):** Power on, registered in the network.
- **Green flashes quickly:** Call in progress.
- **Yellow ON:** GPS- Coordinates are not available or invalid.
- **Yellow flashes (4 sec. interval):** Start-up GSM error (i.e. no SIM card inserted or incorrect PIN configuration or is not ready for operation)
- **Yellow flashes:** GPS- Positions are available and valid.

4.1.1.1 Determining the External Equipment Type

Before you connect the serial port pins on the aforementioned terminals (DCE units) to external equipment, you need to determine if the external hardware serial ports are configured as DTE or DCE.
The terms DTE (Data Terminal Equipment) and DCE (Data Communications Equipment) are typically used to describe serial ports on devices. Computers (PCs) generally use DTE connectors and communication devices such as modems and DSU/CSU devices generally use DCE connectors. As a general rule, DTE ports connect to DCE ports via straight through pinned cables. In other words, a DTE port never connects directly to another DTE port. Similarly, a DCE port never connects directly to another DCE port. The signaling definitions were written from the perspective of the DTE device; therefore, a Receive Data signal becomes an input to DTE but an output from DCE.
For cabling, to connect a DTE device to a DCE device, all you need is a straight through pinned cable.
However, to connect two DTE devices (for example, PC to PC), to transfer data over their serial ports you need a cross pinned cable to simulate the missing pair of DCE devices (modems or DSU/CSUs). This cable is usually called a null modem cable because DCE devices are typically modems.

The Falcom STEPP is designed for use as a DCE. Based on the aforementioned conventions for DCE-DTE connections it communicates with the customer application (DTE) using the following signals:

TANGO Terminal (DCE)	to	Application (DTE)
TxD	◄----------	TXD
RxD	----------►	RXD
RTS	◄----------	RTS
CTS	----------►	CTS
DTR	◄----------	DTR
DSR	----------►	DSR

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DCD	----------►	DCD
RING	----------►	RING

Table 8: The signaling definitions between DTE and DCE.

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5 GSM Core

5.1 General

The modem engine inside the STEPP operates on GSM 900 MHz and GSM 1800 MHz frequency bands.

5.2 GSM data services

300....14400 BPS, asynchronous, transparent and non-transparent
(V.21, V.22, V.23, V.22bis, V.26ter, V.32, V.34, V.110)

5.2.1 RF characteristics

Receiver	
EGSM Sensitivity	< -104 dBm
DCS Sensitivity	< -100 dBm
Selectivity @ 200 kHz	> +9 dBc
Selectivity @ 400 kHz	> +41 dBc
Dynamic range	62 dB
Intermodulation	> -43 dBm
Co-channel rejection	≥ 9 dBc

table 5: Receiver characteristics of the integrated GSM Core

Transmitter	
Maximum output power (EGSM)	33 dBm ± 2 dB
Maximum output power (DCS)	30 dBm ± 2 dB
Minimum output power (EGSM)	5 dBm ± 5 dB
Minimum output power (DCS)	0 dBm ± 5 dB
H2 level	≤ 30 dBm
H3 level	≤ 30 dBm
Noise in 925....935 MHz	≤ 67 dBm

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Noise in 935....960 MHz	≤ 79 dBm
Transmitter	
Noise in 1805....1880 MHz	≤ 71 dBm
Phase error at peak power	< 5° RMS
Frequency error	± 0.1 ppm max

table 6: Transmitter characteristics of the integrated GSM Core

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6 GPS core

6.1 General

The GPS Core is a single-board 12 parallel channel receiver.

6.2 Technical data

FEATURES

- Integrated 12 parallel channel GPS
- Protocols available: RXA/TXA: NMEA 4800 baud, Msg.: GLL, GGA, RMC, , GSV, GSA, 8 data bits, no parity, 1 stop bit

6.2.1 NMEA data message

The STEPP device delivers data in the NMEA-0183 format.
Table 7 lists each of the NMEA output messages supported by the STEPP evaluation receiver and a brief description.
For further description about NMEA see Related documents[4]

Option	Description
GGA	Time, position and fix type data.
GLL	Latitude, longitude, UTC time of position fix and status.
GSA	GPS receiver operating mode, satellites used in the position solution and DOP values.
GSV	The number of GPS satellites in view satellite ID numbers, elevation, azimuth and SNR values.
RMC	Time, date, position, course and speed data.

table 7: NMEA Output Messages

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7 Hardware Interfaces

This chapter describes the hardware interfaces:

- pinout on the 16-pin (Molex) connector
- pinout on the 15-pin (AMP) connector
- RF interface
- SIM interface
- LED's indicator

Interface specifications	
Interface A	16pin Molex 43045-1609
Interface B	SIM card reader for small SIM cards (3V)
Interface C	GPS RF Connector 50 Ω Fakra/Radial (SMB-Male)
Interface D	GSM RF Connector 50 Ω Fakra/Radial (SMB- Male)
Interface E	15pin AMP5-558556-1
Interface F	Optical GSM/GPS LED's

table 8: Interface specifications

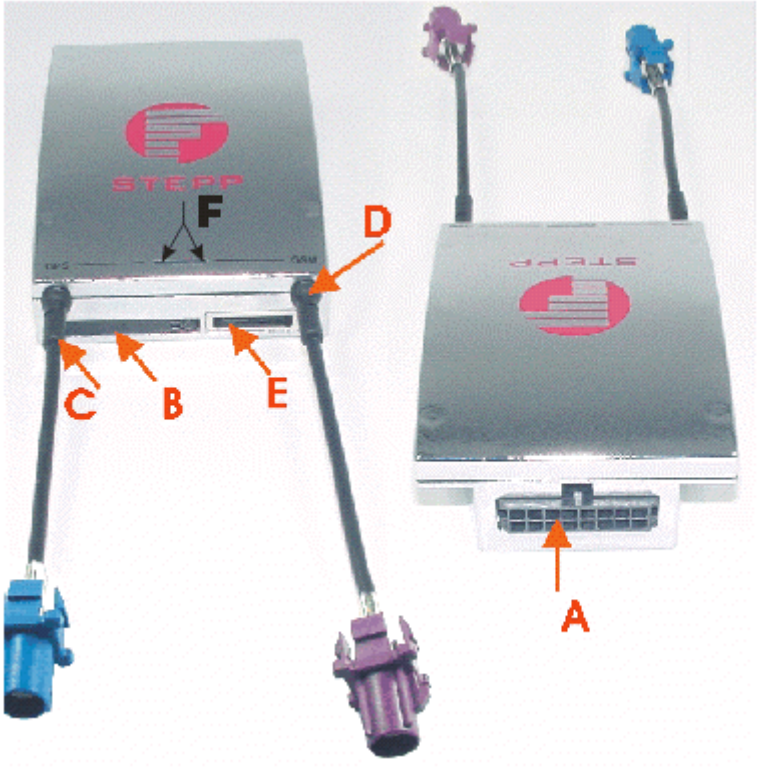

figure 3: Interface specifications

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7.1 Interface A (16pin Molex 43045-1609)

figure 4: View of the 16pin Molex 43045-1609 connector

7.1.1 Description of the 16- pin connector

PIN	NAME	DISCRIPTION	LEVEL
1	MIC N1	Microphone 1 negative input	differential input
2	Analog Input 2	Analog input	up to 32 V / 8 bit resolution
3	MIC P1	Microphone 1 positive input	differential input
4	Analog Input 1	Analog input	up to 32 V DC / 8 bit resolution
5	Output 2	output	Output 10.8 .. 32V DC/ 100 mA
6	Input 4	input	Input 10.8 .. 32V DC
7	Output 1	output	Output 10.8 .. 32V DC / 100mA
8	Input 3	input	Input 10.8 .. 32V DC
9	Output 3	output	Output 10.8 .. 32V DC / 100 mA
10	Input 2	input	Input 10.8 .. 32V DC
11	Output 4	output	Output 10.8 .. 32V DC / 100 mA
12	Input 1	input	Input 10.8 .. 32V DC

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PIN	NAME	DISCRIPTION	LEVEL
13	Ignition	Input 8	Input 10.8 .. 32V DC
14	BATT On/Off (Key Accu on Eval board)	Switch ON/OFF the internal LiIon-Battery. **Do not connect this pin to power supply (V+).**	**connected to GND:** -switch the internal Battery ON and the battery would be charged **disconnected from GND:** -switch the internal Battery OFF and the battery wouldn't be charged
15	V+	Power supply Input 7	Input 10.8 .. 32V DC
16	GND	GROUND	

table 9: Pin discription of 16pin Molex connector

7.1.2 Special pin description

7.1.2.1 Analog inputs (pin 2, 4)

Analog voltages up to 32 V with a resolution of 8 bit can be processed and remotely evaluated by a server application.

↓ ***Connection example for analog input 2:***

Pin 2 (analog input 2) can be connected to a temperature sensor (a NTC resistor for instance) with restriction values, if the temperature rises/falls, the STEPP reacts, and sends a message (SMS with voltage values depending on the user configuration) to the receiving device (mobile phone, modem or any GSM device), see the illustrated example in the figure below.

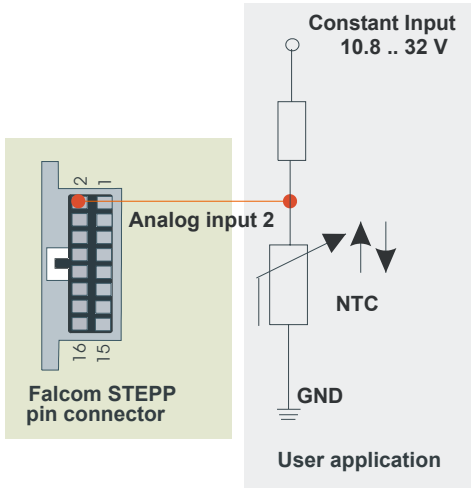

figure 5: Connection example for analog input 2

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↓ ***Connection example for analog input 1:***

Likewise, on pin 4 (analog input 1) you can install a tachometer generator. Its functionality is just like pin 2 (analog input 2). The maximum output voltage of the tachometer is 32 V (see the illustrated example in the figure below).

NOTE: The tachometer and NTC are only examples to show the aim of the analog inputs.

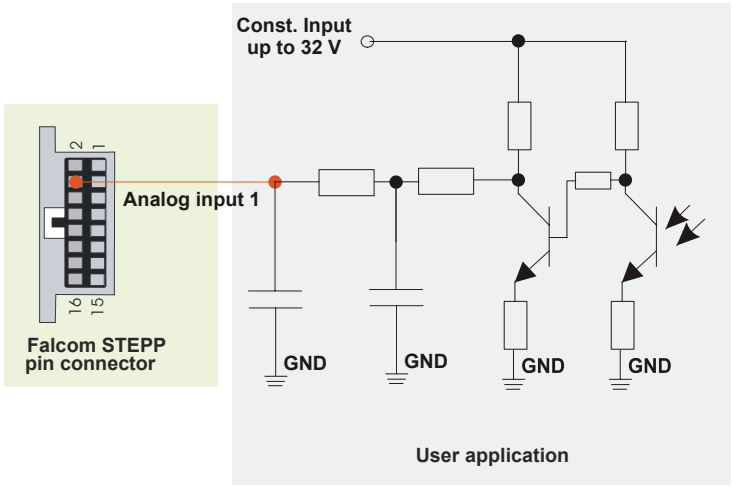

figure 6: Connection example for analog input 1

7.1.2.2 Inputs (pin 6, 8, 10, 12)

The Inputs (pin 6, 8, 10, 12) of 16-pin connector can be connected to 10.8 .. 32 V DC. The figure below illustrates how to connect these inputs. If one of the connected pins (inputs) is activated (for minimum 1 sec), STEPP will send SMS with a pre-configured text massage to the Server application. The inputs can be configured by using the FALCOM demo software. For more information see chapter Installation guidance for 16pin Molex connector.

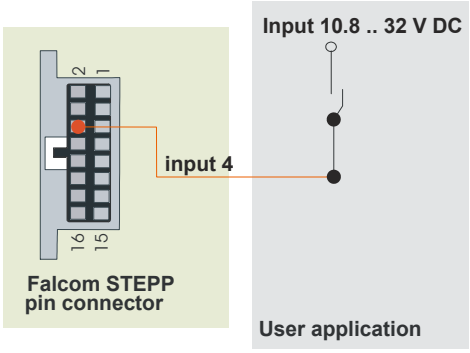

figure 7: Connection example for input 4

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7.1.2.3 Outputs (pin 5, 7, 9, 11)

The STEPP supports four outputs. These can be set remotely by the server application. The figures below show the schematic of possible output configurations.

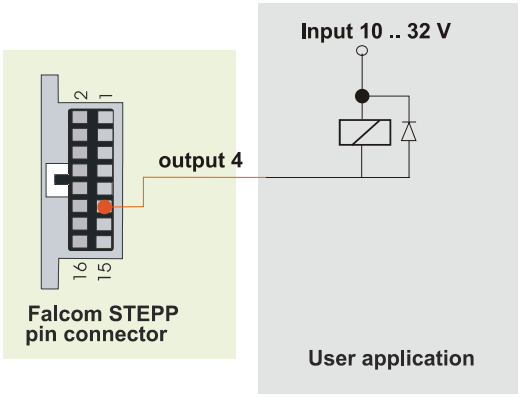

figure 8: Connection example 1 for output 4 (Relay)

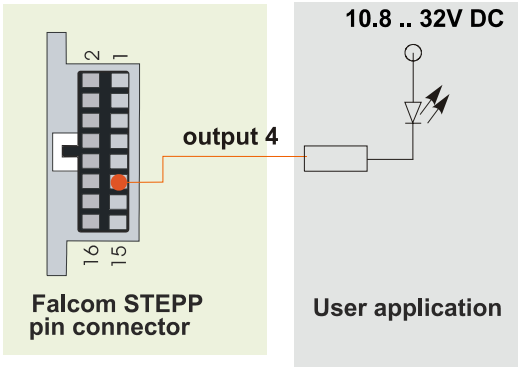

figure 9: Connection example 2 for output 4 (LED)

7.1.2.4 BATT On/Off (pin 14)

This pin has to be connected to ground (GND) in order to power on the Falcom STEPP via internal battery as well to charge it. If the Falcom STEPP is not in use for a long time (e.g warehouse) this pin can be left open.

Caution: Please do not connect this pin to power supply (V+).

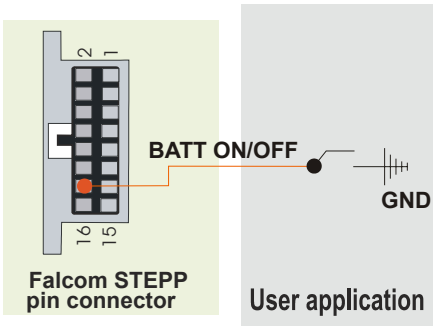

figure 10: BATT ON/OFF connection example

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7.1.2.5 Ignition (pin 13)

STEPP provides two Ignition Pins (pin 13) on the Molex and AMP connectors. Their functionality is the same. The Ignition line of the vehicle (starter lock clamp 15) has to be connected to the Pin 13. Thus it is possible to send an Alarm SMS (by starting the engine), provide the STEPP has been configured respectively. Pin 13 of the Molex connector and AMP connector are connected internally, so that they can be connected alternatively. For more information see the corresponding figure in chapter "Installation guidance for 16pin Molex connector".

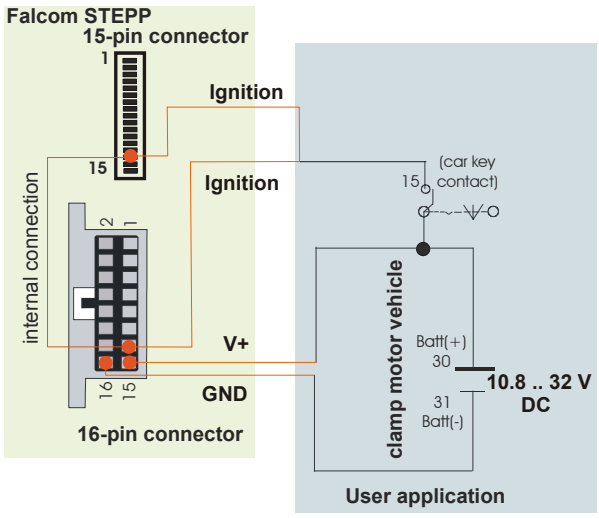

figure 11: Ignition connection example

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7.2 Interface B (SIM-Card interface Molex-91228-0002)

The figure below shows the SIM-card reader interface of the STEPP.

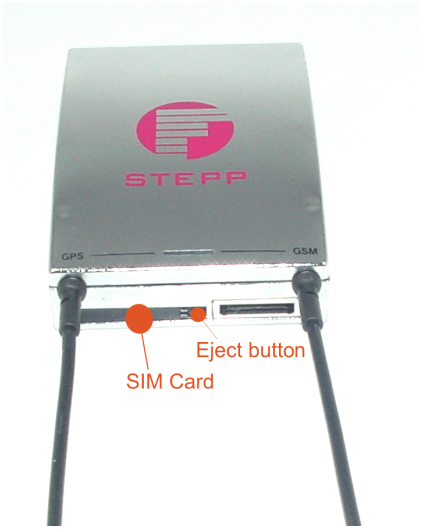

figure 12: View of the SIM Card reader

The SIM interface controls a internal small 3V SIM Card. This interface is fully compliant with GSM 11.11 recommendations concerning SIM functions.

Note: The SIM should not be removed, while the module is powered on. The SIM must only be removed when the STEPP is shut down. To remove the SIM card press the Eject button (see figure 12) then pull out the SIM card reader.

Note: The unit is not designed for use of single 5 V SIM cards. These cards will generate an error which cannot be distinguished from a faulty SIM card.

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7.3 Interfaces C and D

The below figure shows the GPS/GSM Antenna interfaces of the STEPP.

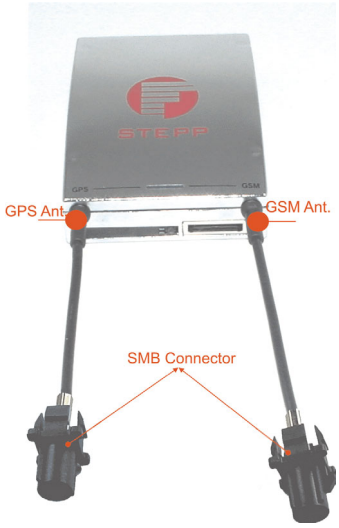

figure 13: View of the GSM/GPS antenna cable.

Both GSM/GPS-antenna cables are connected to STEPP. Both of them have a SMB connector. The GSM antenna cable is longer than GPS antenna.

⇒ **GPS-antenna cable: 87.60 mm (colour blue)**
⇒ **GSM-antenna cable: 99.00 mm (colour bordeaux)**

7.4 Interface E (AMP 5-558556-1 Connector)

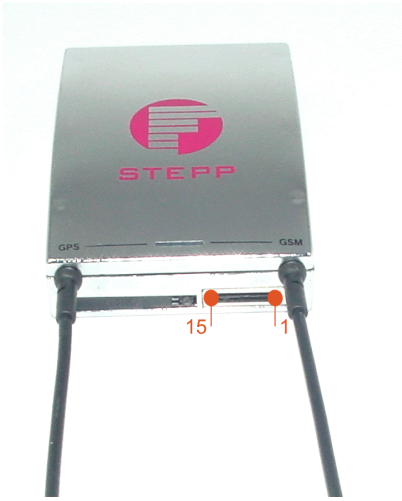

Figure 14: View of the 15pin AMP5-558556-1 connector

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7.4.1 The 15- pin connector description

PIN	NAME	DISCRIPTION	LEVEL
1	GND	GROUND	
2	GND	GROUND	
3	SPK N1	Speaker 1 negative output	differential output
4	SPK P1	Speaker 1 positive output	differential output
5	VC 5	Power supply output	5 V DC output max 100 mA
6	V Accu	Battery controller	3,3 .. 4,2 V DC
7	MIC N2	Microphone 2 negative input	differential input
8	MIC P2	Microphone 2 positive input	differential input
9	SPK N2 with amplifier	Speaker 2 negative output	8 Ω / 1 W
10	SPK P2 with amplifier	Speaker 2 positive output	8 Ω / 1 W
11	Boot select	**Connect to GND in case of firmware update. For a normal STEPP operation leave it floating**	
12	Ring PWM	80 mA max output	CMOS 2,8 V output
13	Ignition	input 8	Input 10.8 .. 32V
14	RxA RS232	Receive serial data	V24, ±12 V output
15	TxA RS232	Transmit serial data	V24, ±12 V input

table 10: Pins discription of 15pin AMP connector

7.4.2 Special pin description

7.4.2.1 VC 5

This output can be used to power some external functions. VC 5 has to be used as a power supply. This power supply is available when the module is on.
To use this pin see chapter Installation guidance for 16pin Molex connector at the end of this manual.

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7.4.2.2 Boot select

To update a new STEPP firmware, this pin should be connected to GND. For a normal STEPP operation (tracking, call, etc.) this pin shouldn't be connected (leave floating).

7.4.2.3 RxA, TxA

Using the RS232-Signals RxA and TxA, a communication to a PC serial port can be established. In this way the device can be configured using the SteppConfig software.
The SteppConfig is available on the Falcom's Website for free download:
➔ www.falcom.de/service/downloads/manual/stepp

7.4.2.4 Speaker outputs characteristics

A speaker can be connected directly to the pin 9 and pin 10. The standard level is 8 Ω / 1 Watt. We recommend loudspeakers with more power for better voice quality. See table below.

PIN	NAME	DESCRIPTION	LEVEL
9	SPK N2 with amplifier	Speaker 2 negative output	8 Ω / 5 W
10	SPK P2 with amplifier	Speaker 2 positive output	8 Ω / 5 W

table 11: Description of recommended speaker characteristics.

7.5 Interface F (LED's description)

The below figure shows the GSM/GPS LED's on STEPP.

figure 15: View of the GSM/GPS LED's.

The two LED's show the state of the STEPP:

- Green: GSM network (about its functionality see chapter Functional description).
- Yellow: GPS (about its functionality see chapter Functional description).

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8 Housing

The housing material: Galvano-ABS, gloss-chromium-plated.

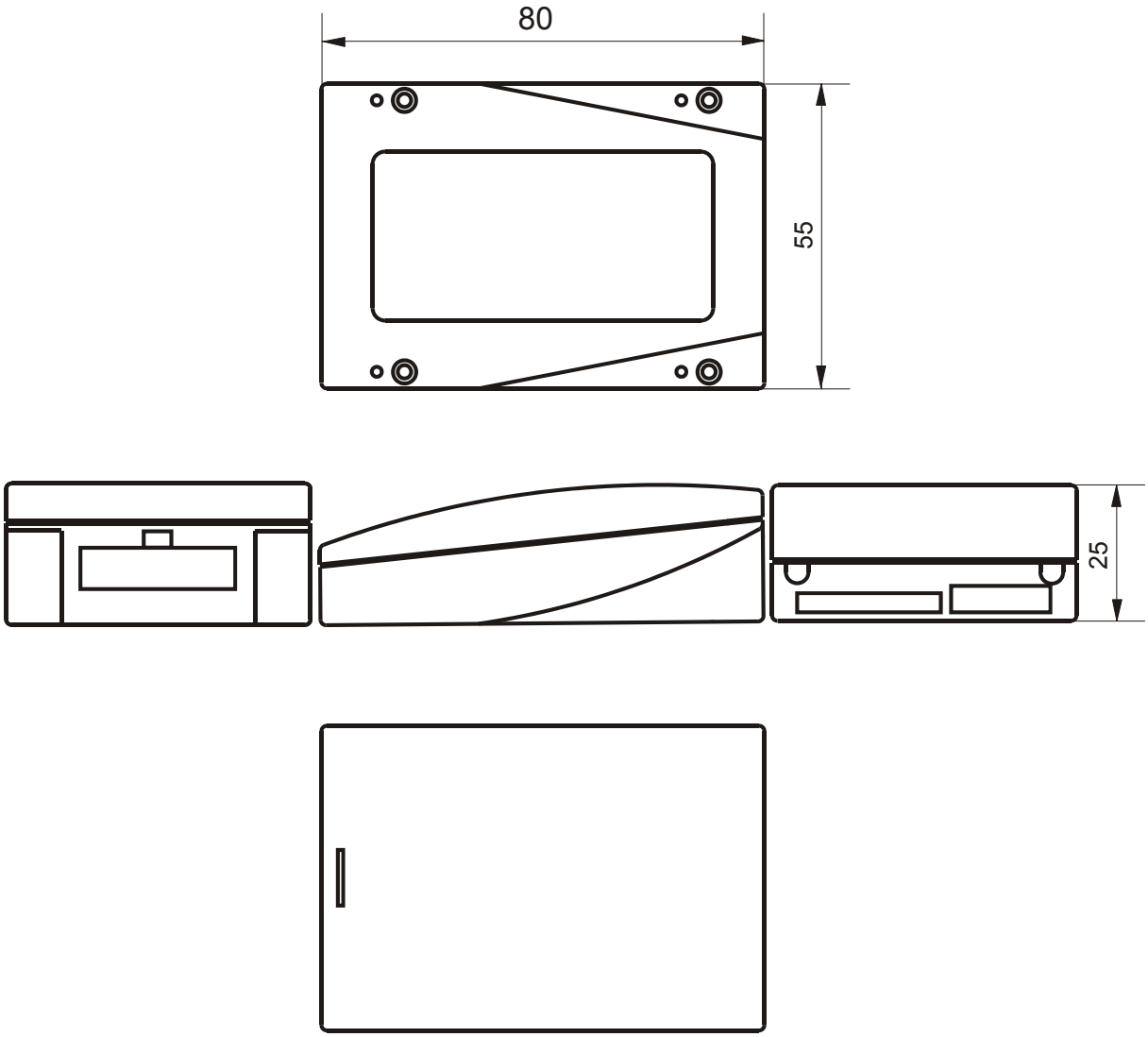

figure 16: Housing of the STEPP.

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9 STEPP-Mounting bracket

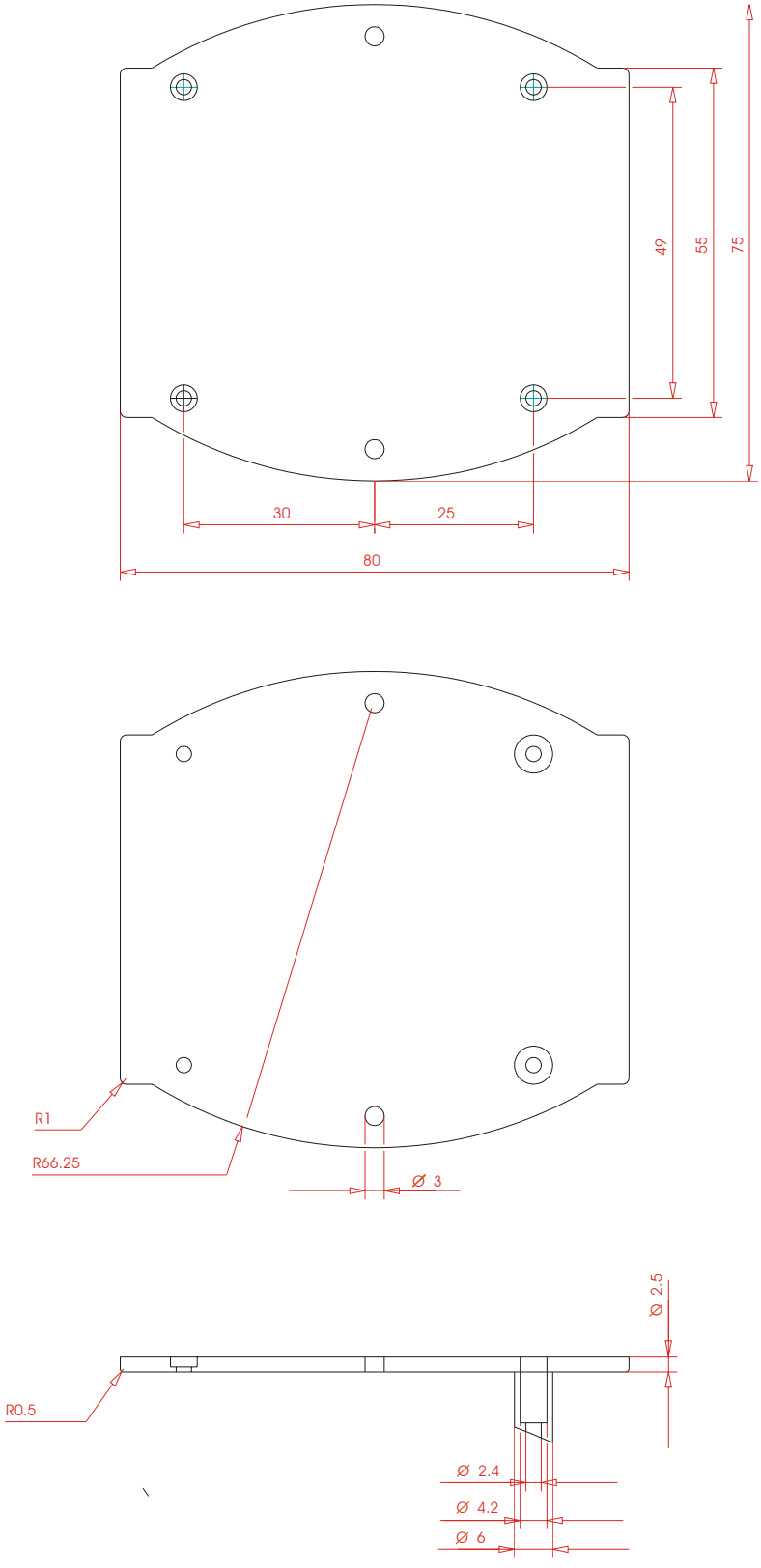

figure 17: Mounting bracket of the STEPP

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10 Appendix

10.1 Schematics

The figures below illustrate the recommended schematics for the connection of the 16 pin Molex and 15 pin AMP connectors.

10.1.1 Installation guidance for 16pin Molex connector

On the top of the schematic the corresponding pin out of the 16-pin Molex connector can be found.

The STEPP provides 6 inputs, 4 outputs and 2 analog inputs.

Of the 6 inputs, 4 input are free available for the user. Two of the inputs are pre-assigned at the factory:

- Power Supply - connect to vehicle battery (clamp 30).
- Ignition - connect to starter lock (clamp 15).

Ensure that the operating voltage (V+) of the terminal and external power source (i.e. car battery) incorporates a protection circuit against over current, which has to be limited to 2 A at +10.8 … +32 VDC. See circuit diagram below.

A microphone can be connected to pin 1 and pin 3 of the 16-pin Molex connector.

The figure 18 shows an example for the installation of the STEPP-I/O's in a motor vehicle.

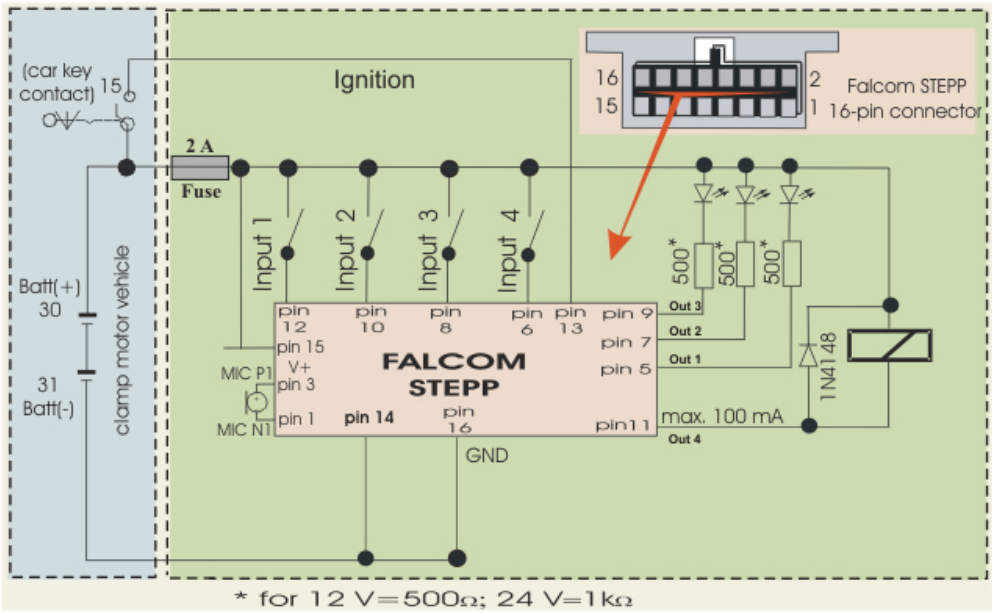

figure 18: Schematic example of installation guidance

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10.1.2 Installation guidance for 15-pin AMP connector

Figure 19 shows an example of an installation that enables voice communication.

STEPP supports two differential microphone inputs and two differential speaker outputs.

The integrated amplifier allows direct connection of a Hands-Free- to Pin 9 and Pin 10.

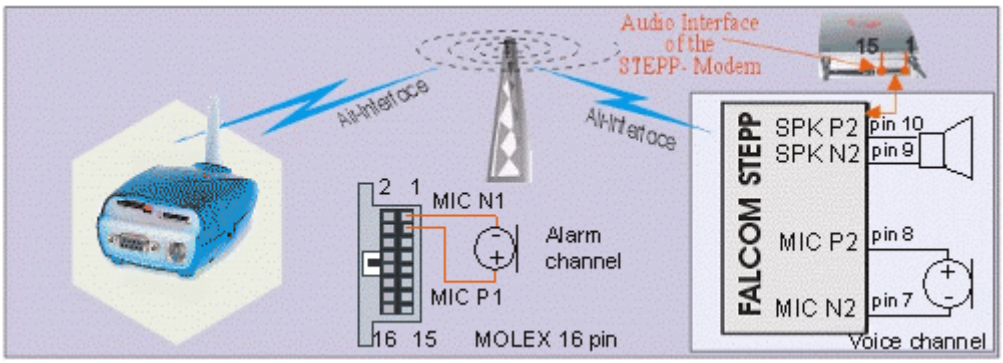

figure 19: Possible installation for enabling voice connection.

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